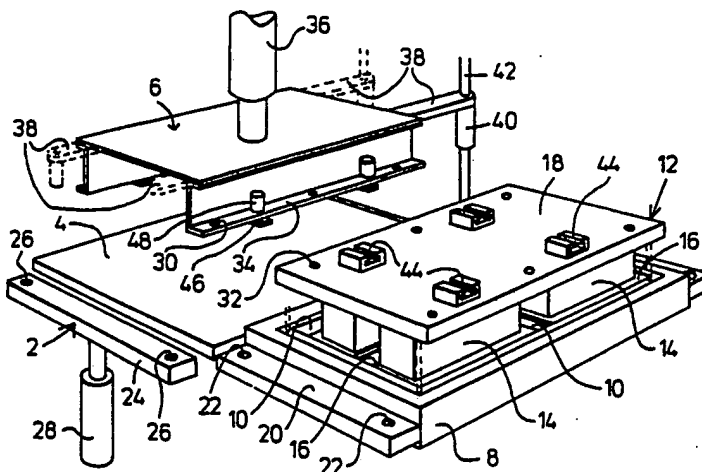




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(21) International Application Number: PCT/DK90/00313 (22) International Filing Date: 30 November 1990 (30.11.90) (30) Priority data: 6063/89 1 December 1989 (01.12.89) DK (71) Applicant (for all designated States except US): KVM INDUSTRIMASKINER A/S [DK/DK]; Industrivej 2, DK-8620 Kjellerup (DK). (72) Inventor; and (75) Inventor/Applicant (for US only) : HANSEN, Hans, Spangenberg [DK/DK]; Egebakken 30, DK-8620 Kjellerup (DK). (74) Agent: SKØTT-JENSEN, K.; Lemmingvej 225, DK-8361 Hasselager (DK).		(81) Designated States: AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CA, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE, DE (European patent), DK, DK (European patent), ES, ES (European patent), FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), GR (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US. Published <i>With international search report.</i> <i>In English translation (filed in Danish).</i>

(54) Title: A METHOD OF MOUNTING A MOULD SYSTEM IN A BLOCK STONE MOULDING MACHINE, AND A CORRESPONDINGLY ADAPTED MOULDING MACHINE AND MOULD SYSTEM

**(57) Abstract**

In machines for moulding block stones a cellular mould (8) is used underneath a compacting head (12) having press plates (16) that can be pressed down for compressing the concrete mass in the moulding cells (10) and for pressing out the moulded stone members when the mould is raised. The mould (8) is fixed to lower carrier means (24) and the compacting head (12) to an overlying carrier head (6) in a mutually accurately centered manner, which requires high accuracies in the making of holes for the spanner bolts, while also the mounting of the compacting head is difficult to carry out. According to the invention the compacting head is directly precentered in the mould (12) by means of distance pieces (52), and the entire mould unit (8, 12) thus preassembled, is moved into the space between the carrier head (6) and the carrier means (24) for the mould (8), whereafter the mould (8) is secured to the carrier means. By the insertion of the mould unit into the said space a 'floating' engagement is established between co-acting holding portions (44, 46) at the lower side of the carrier head (6), and upon fixation of the mould (2) working cylinders (48) are actuated to pull up the holding portions (46) of the carrier head for clamping the compacting head in its centered position. Thereafter the distance pieces are removed and the machine is ready for operation. Thus, the compacting head will be very easy to mount, and generally very coarse tolerances can be used.

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A method of mounting a mould system in a block stone moulding machine, and a correspondingly adapted moulding machine and mould system.

The present invention relates to a block stone moulding machine and a mould system therefor. For producing block stones with different shapes in such a machine use is made of mould systems consisting of mould frames with respective, particularly shaped moulding cells and associated compacting heads in the form of a plate with downwardly projecting, rigid pressing foot portions having lower, horizontal press plates matching the shape of the moulding cells, such that all these press plates can be moved down into the moulding cells at the same time. The mould frame is placed on a moulding surface, and for each operation concrete mass is filled into all the moulding cells by means of a concrete charged filler cart or the like, which is displaced over the top side of the mould frame and retracted therefrom, whereafter the compacting head is lowered from a raised position for pressing the press plates against the concrete mass in each of the moulding cells, while the mould is vibrated. Hereby the concrete mass is compacted. When the desired product height has been achieved the compacting head is arrested in its lower position and the mould frame is pushed upwardly, such that the moulded block stone members are left freely standing, and finally also the compacting head is raised from its holding engagement with these members, whereafter the stone members with the associated moulding plate are automatically removed from the production area. The mould frame is lowered into its working position on the moulding plane, and a new working cycle can be initiated.

The means for anchoring and vertically moving the

mould frame should be mounted and controlled with high accuracy relatively to the means carrying the compacting head, such that by the lowering of the compacting head the press plates thereof will pass down into the moulding cells without hitting the top edges of the cells. Often the clearance between the outer edges of the press plates and the surrounding walls of the moulding cells should be only some 0.5 mm, and the tolerance of the associated guiding should be still much finer.

The relevant holding means are constituted by heavy machine parts, which can well be held and guided with a high mutual accuracy. The rest, then, will be a question of the mould parts being secured to the holding means with the same high accuracy, and here it is important that different sets of mould systems should be mountable, such that it is not sufficient to arrange for an accurate mounting once and for all.

The mould frame is suitably made with laterally protruding flanges having accurately placed holes for receiving spanner means on the associated, guided raising and lowering means, while the compacting head is secured to an overlying carrier head, which is mounted and guided just as accurately relatively to the holding means of the mould frame. Traditionally, this carrier head is provided with accurately positioned holes for receiving clamp bolts for the fixation of the top plate of the compaction head, this top plate correspondingly being provided with accurately positioned bolts or bolt holes, such that the desired result will be obtained when both the mould frame and the compaction head are fastened by bolting, with the use of the already prepared bolt holes.

In practice, however, this implies two significant problems, viz. that it is a difficult and time consuming work to carry out the fixation of the compacting head on the carrier head, and that the bolts or bolt holes of

the compacting head shall have to be positioned with the said high accuracy.

It is the purpose of the present invention to provide an arrangement, with which these problems are minimized.

According to the invention the holding means of the carrier head are constituted by depending, upwardly tightenable gripping members, which are profiled so as to be able to receive correspondingly profiled, upstanding engagement members at the top side of the compacting head, such that the compacting head can be mounted on the carrier head by a horizontal insertion movement and a subsequent tightening up of the gripping members of the carrier head for effectively anchoring clamping the engagement members of the compacting head. This insertion is effected with the compacting head in engagement with the mould frame and with the press plates centered in the moulding cells, viz. by a premounting of distance pieces between selected edge portions of the press plates and the adjacent wall portions of the respective moulding cells. The insertion of the mould frame with the compacting head already mounted therein is effected until the mould frame assumes its position for being fixed to the complementary holding means of the machine, whereafter this fixation is worked out, whereby the entire mould system is secured in a reference position relatively to the machine. At the same time the engagement members of the compacting head will be brought into a 'floating' engagement position relative to the gripping means of the carrier head, and when the gripping means are thereafter actuated for fixation of this position of engagement it will be achieved that the compacting head is automatically secured to the machine in a correct position relatively to the mould frame. Thereafter the said distance pieces in the mould frame can be removed, and the machine can be taken in use.

Just because of the 'floating' engagement between the carrier head and the compacting head as hereby made possible it is also made possible to neglect qualified tolerance requirements for the positioning of the anchoring means, since an accurate positioning will be obtained anyway, namely due to the temporarily established primary centering of the compacting head relatively to the mould frame and the primary orientation of the mould frame relatively to the machine, and already the elimination of these requirements will be an important advantage.

However, the invention provides for an additional important possibility, viz. that of the compacting head being secured to the carrier head automatically, without the troublesome use of the spanner bolts as used hereinbefore. With the invention no bolt tightening is to be effected, but just a pulling up of the said gripping members, and such a pulling up may be effected in an easy manner by means of one or more working cylinders or correspondingly simple moving and holding means. Such cylinders may well be placed and perform tightening operations at manually not easily accessible places, and it is thus an attractive result of the invention that the centered fastening of the compacting head can be effected in a quite simple manner at suitable places, also where these would not be easily accessible.

Moreover, the consumption of time for changing out a mould system will be reduced considerably, whereby the production can be increased, and the better and safer centering of the press plates in the mould cells will reduce the wear on the mould.

In the following the invention is described in more detail with reference to the drawing, in which:-

Fig. 1 is a perspective view of parts of a block stone machine and a mould system adapted therefor,

Fig. 2 is a lateral view thereof, and

Figs. 3 and 4 are detailed views of a fastening arrangement.

In the left side of Fig. 1 a couple of main parts of a block stone machine is indicated, viz. carrier means 2 for holding a mould frame above a moulding table 4 and an upper carrier head 6 for an underlying compacting head for cooperation with the mould frame. In the right hand side an associated mould system is illustrated, consisting of a lower mould frame 8 having throughgoing moulding cells and an upper compaction head 12 provided with depending pressing foot portions 14, which project down into the moulding cells and are provided with lowermost, transverse press plates 16 shaped according to the cross sectional shape of the moulding cells and being only slightly smaller than that. The compacting head has a top plate 18, to which the foot portions 14 are secured by welding, and the mould frame 8 is provided with laterally projecting flanges 20 having bolt holes 22.

The carrier means for the mould frame 8 are constituted by opposed, horizontal carrier pieces 24 operable to support the flanges 20 of the mould frame and having bolting holes 26 for cooperation with the holes 22, such that the mould frame 8 may be anchored in a conventional manner with a highly accurate positioning relatively to the moulding machine, despite that in connection with the invention it is not so important that this accuracy be particularly high. The carrier pieces 24 are mounted in a vertically movable manner in the machine, here illustrated by the use of an underlying, vertical working cylinder 28. Conventionally, corresponding bolt holes 30 and 32 could be provided in the lower flange portions 34 of the carrier head 6 and in the top plate 18 of the compacting head 12, but in connection with the invention such holes are not used. On the other hand, the invention is of a character

such that these holes may well be present, inasfar as the invention can be exploited by simple additions to already consisting machine and mould parts.

According to the invention there is mounted on the top side of the top plate 18 of the compacting head some lying C-profiled holding members 44, which are open upwardly and in the length direction forwardly towards the carrier head 6. On this head there is correspondingly mounted some holding pieces 46 rigidly secured to the lower ends of piston rods depending from respective, rigidly secured working cylinders 48. When these holding pieces 46 assume a lowered free position they will be operable to freely receive the inserted holding members 44 as illustrated in Fig. 3. This insertion is effected by the mould system 8,12 as shown in Fig. 2 being placed on a carriage 50, which, on a conveyor surface 52 in front of the moulding plate 4, is moved onto this plate with the carrier head adjusted to such a height position that the lower holding pieces 46 are situated just in level with inner recesses of the C-profiled members 44, i.e. the latter can freely be driven into respective positions in which they are entirely loosely engaging the holding pieces 46. In this inserted position of the mould system 8,12 there is effected an anchoring of the mould frame 8 to the carrier pieces 24, these being raised to the relevant mounting level. Hereby the positioning of the mould frame in the moulding machine will be determined.

It is important to notice that before the introduction of the cart 50 the compaction head 12 has been centered relatively to the mould frame by means of distance pieces 52, which are mounted between edge areas of some of the press plates 16 and the adjacent wall portions of the moulding cells 10, whereby a correct mutual positioning of the mould frame 8 and the compacting head 12 will be ensured in a direct manner, i.e. not

indirectly as if based on the use of the bolt holes 30 and 32.

When the mould system 8,12 has been brought into position and the mould frame secured to the carrier pieces 24 the cylinders 48 are actuated for pulling up the holding pieces 46, whereby these, as shown in Fig. 4, will clamp the upper profile flanges 54 of the C-profiled holding members 44 upwardly against the lower side of the lower flanges 34 of the carrier head 6, such that hereby the entire compacting head 12 will be fixed the the carrier head in a correctly centered position relative to the the mould frame. In the profile members 44 there is a certain clearance for the holding pieces 46 in both the longitudinal and the cross direction, such that the tolerance requirements will here be very low.

Once the compacting head 12 has thus been secured by clamping to the carrier head the distance pieces 52 can be removed, whereafter these parts 12 and 6 are freely displaceable in the vertical direction, with a maintained accurate mutual centering in the horizontal plane. The mould frame 18 can be lifted slightly, so as to get free of the cart 50, whereafter the cart can be removed from the area. Then the mould frame 8 is lowered to rest on the moulding table 4, and the compacting head 12 can be raised until there is sufficient room for the introduction of the said filler cart or frame for supplying concrete mass to the mould frame 8.

Thereafter the moulding machine can operate fully conventionally, the compacting head 12 being lowered for compacting the concrete mass in the single moulding cells 10 and later being arrested for pressing down the moulded stone members towards the moulding table 4 while the mould frame 8 is moved upwardly from the moulded stone members for liberating these to be delivered outwardly along the conveyor path 53, Fig. 2.

The invention is of course not restricted to the illustrated arrangement, in which the carrier head 6 is provided with upwardly retractable holding pieces 46, since, by way of example, it would be equally well possible to make use of upwardly retractable profiled holding portions cooperating with upstanding, rigid holding head portions on the compacting head 12.

It is not strictly necessary to modify the carrier head 6 by adding the parts 48, 46, as these parts might be provided on a separate carrier plate that can be fastened to the carrier head by bolting, using the bolt holes 30. This will even make possible that the carrier head can be used alternatively in a conventional manner, which might be desirable in certain situations that should not here be described in more detail.

It may occur that it is desired to introduce distance means between the underside of the carrier head 6 and the top side of the compacting head 12, but in connection with the invention this will be perfectly possible, e.g. by securing to the compacting head 12 by means of the bolt holes 32 an upstanding structure having upper holding rails or members corresponding to the profiled members 44.

It is to be emphasized that the invention provides for the special advantage that in a relatively simple manner the invention can be realized also in connection with already existing moulding machines, namely with only the discussed modifications of the carrier head and the compacting heads 12, respectively.

C L A I M S :

1. A method of mounting a mould system(8,12) in a block stone moulding machine, whereby a mould frame (8) with moulding cells 10) is secured to a vertically displaceable support (2) in a position above a moulding surface (4), while an associated overlying compacting head (12), having depending pressure foot portions (14) with lower press plates (16) to be lowered into the moulding cells, is secured to an overlying, vertically movable carrier head (6) in a position thereon such that the press plates (16) by a lowering of the carrier head (6) relatively to the mould frame (8) will be lowered into the cells (10) well centered therein, characterized in that the mould system (8,12) is prepared for the mounting by arranging the compacting head (12) in a temporarily fixed and centered engagement position in the mould frame (8), by placing centering distance pieces (52) between selected edge areas of the press plates (16) and the adjacent wall portions of the moulding cells (10), and that the mould system thus assembled is inserted between the carrier means (2) for the mould frame (8) and the said carrier head(6), whereas by this insertion the mould frame is brought into a position, in which it is readily securable to the carrier means, while at the same time the compaction head (12) is brought into a position, in which upstanding engagement means (44) on the top side of the compacting head have been introduced so as to loosely engage with gripping means (46) depending from the lower side of the carrier head (6) in an upwardly retractable manner, said gripping means (46) thereafter being actuated to be upwardly retracted so as to thereby clamp the compacting head (12) to the carrier head (6) in the respective centered position relative to the mould frame (8), whereafter the distance pieces (52) are removed for liberation of the mould parts for operative function thereof.

2. A method according to claim 1, characterized in that the preassembled and internally centered mould system (8,12) is introduced into the mounting area in being moved on a movable support(50), the carrier head (6) hereby being held in such a height position that the upper engagement means (44) of the compacting head (6) are moved into initial engagement with the gripping means (46) depending from the carrier head (6).

3. A block stone and tile moulding machine for the carrying out of the method according to claim 1, characterized in that its carrier head (6) is provided with depending, upwardly tightenable gripping means (46) for floating engagement with complementary, upper engagement means (44) on the compacting head (12) in the introduced mounting position thereof.

4. A block stone machine according to claim 3, characterized in that the gripping means (46) are upwardly tightenable by means overlying working cylinders (36).

5. A mould system for a block stone machine according to claim 3, comprising a lower mould frame (8) with moulding cells (10) and an upper compacting head (12) having depending press plate portions (16) to be lowered into the moulding cells, characterized in that on an upper plate portion (18) of the compacting head there are mounted upwardly projecting, profiled members (44), which, by introduction of the preassembled and pre-centered mould system (8,12) into a mounting position in the block stone machine, can floatingly engage with upwardly tightenable gripping means (46) mounted depending from the lower side of a vertically movable carrier head (6) in the block stone machine.

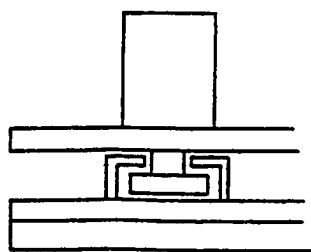
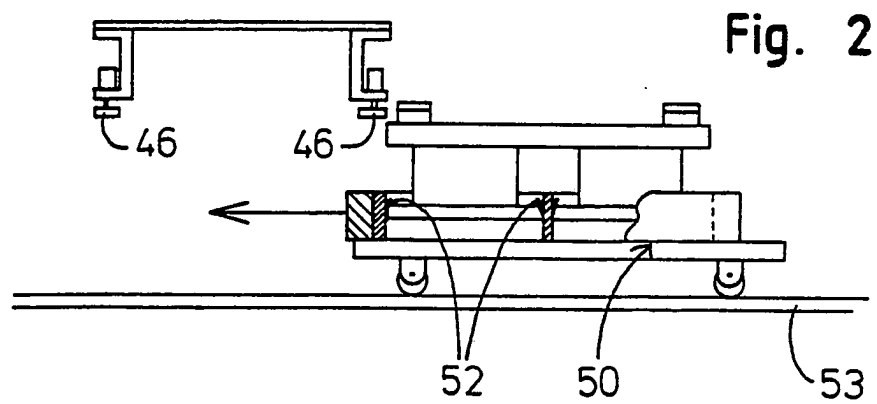
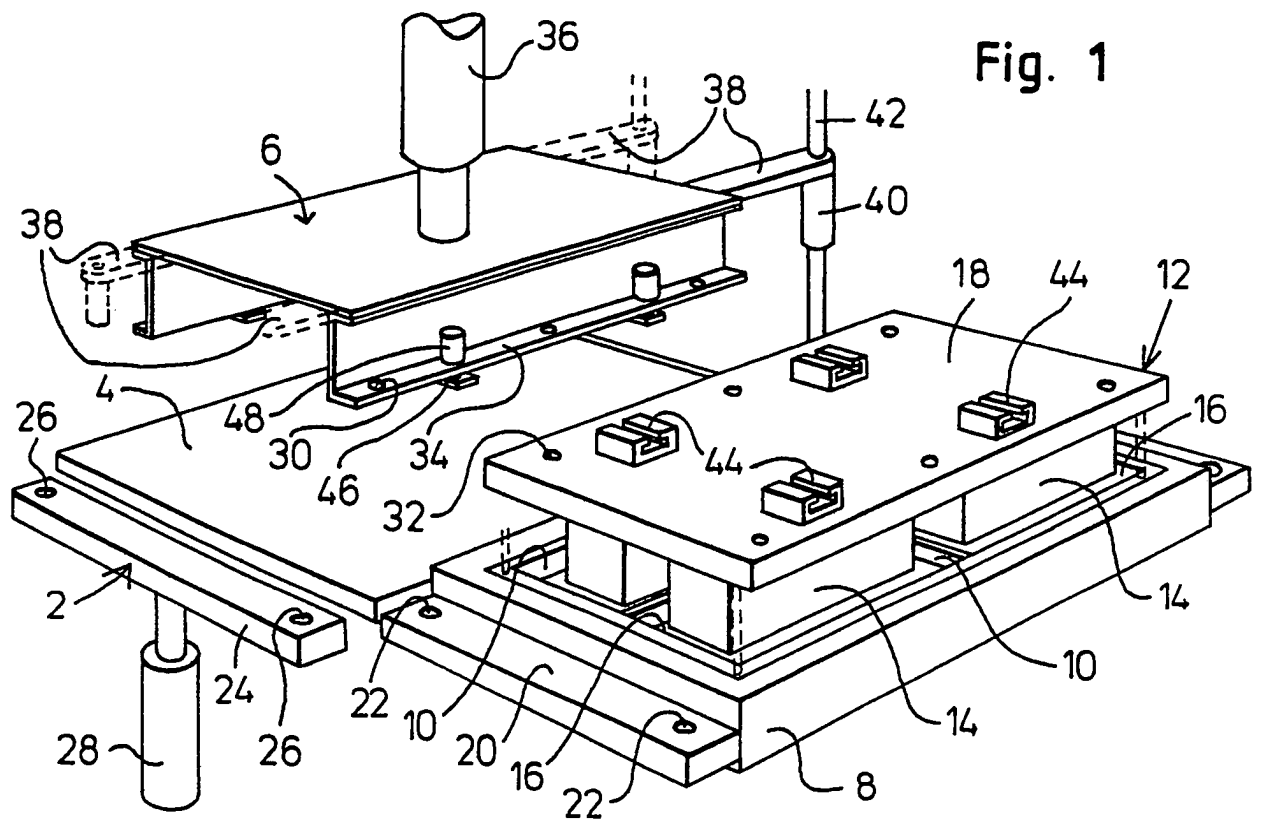


Fig. 3

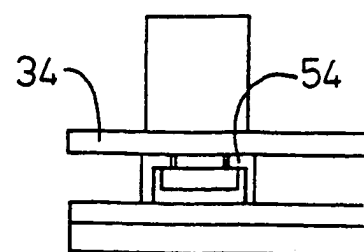
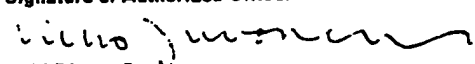
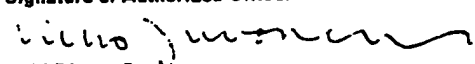
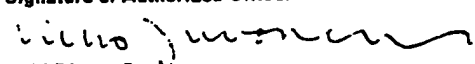


Fig. 4

INTERNATIONAL SEARCH REPORT

International Application No PCT/DK 90/00313

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: B 28 B 3/04																	
II. FIELDS SEARCHED <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Minimum Documentation Searched⁷</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 25%; border-bottom: 1px solid black;">Classification System</th> <th style="border-bottom: 1px solid black;">Classification Symbols</th> </tr> <tr> <td style="padding: 5px;">IPC5</td> <td style="padding: 5px;">B 28 B</td> </tr> </table> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched⁸</div> <p style="padding: 5px;">SE,DK,FI,NO classes as above</p>			Classification System	Classification Symbols	IPC5	B 28 B											
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III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹ <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%; padding: 5px;">Category *</th> <th style="width: 70%; padding: 5px;">Citation of Document,¹¹ with indication, where appropriate, of the relevant passages¹²</th> <th style="width: 20%; padding: 5px;">Relevant to Claim No.¹³</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">Y</td> <td style="padding: 5px;">GB, A, 2139550 (JOHN HASTINGS D'OYLY SNOW) 14 November 1984, see figure 2 --</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-5</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">Y</td> <td style="padding: 5px;">DE, A1, 1627900 (DANLY MACHINE CORP.) 22 July 1971, see figure 2 and 3 --</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-5</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">GB, A, 742734 (L. PATRIGNANI) 4 January 1956, see figure 2 --</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-5</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">US, A, 3111895 (D.H. KRAFT ET AL) 26 November 1963, see figure 2 -- -----</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-5</td> </tr> </tbody> </table>			Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	Y	GB, A, 2139550 (JOHN HASTINGS D'OYLY SNOW) 14 November 1984, see figure 2 --	1-5	Y	DE, A1, 1627900 (DANLY MACHINE CORP.) 22 July 1971, see figure 2 and 3 --	1-5	A	GB, A, 742734 (L. PATRIGNANI) 4 January 1956, see figure 2 --	1-5	A	US, A, 3111895 (D.H. KRAFT ET AL) 26 November 1963, see figure 2 -- -----	1-5
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<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>* Special categories of cited documents:¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p> </div> </div>																	
IV. CERTIFICATION <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px; vertical-align: top;"> Date of the Actual Completion of the International Search 26th February 1991 </td> <td style="width: 50%; padding: 5px; vertical-align: top;"> Date of Mailing of this International Search Report 1991 -02- 28 </td> </tr> <tr> <td style="padding: 5px; vertical-align: top;"> International Searching Authority <div style="text-align: center;">SWEDISH PATENT OFFICE</div> </td> <td style="padding: 5px; vertical-align: top;"> Signature of Authorized Officer <div style="text-align: center;">  Vilho Juvonen </div> </td> </tr> </table>			Date of the Actual Completion of the International Search 26th February 1991	Date of Mailing of this International Search Report 1991 -02- 28	International Searching Authority <div style="text-align: center;">SWEDISH PATENT OFFICE</div>	Signature of Authorized Officer <div style="text-align: center;">  Vilho Juvonen </div>											
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**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO. PCT/DK 90/00313**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on **91-01-31**.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A- 2139550	84-11-14	AU-B- 573577	88-06-16
		AU-D- 2590284	84-10-04
		JP-A- 59185612	84-10-22
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GB-A- 742734	56-01-04	NONE	
US-A- 3111895	63-11-26	NONE	